Breakthroughs in the Assurance Research Process

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JPL

California Institute of Technology

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Mission Success Starts With Safety

- **Today, we must enhance safety while doing more with less**
- **NASA is not alone in this charge**
- **By pooling our resources and expertise we can do much more with much less**
  - Put the worlds' best talent together
  - Capitalize on others' strengths and knowledge
  - Leverage resources
  - Produce more meaningful results, faster

Assurance Research Process

- **Industry and NASA face common challenges to Mission Safety**
  - Rapid technology evolution
  - Miniaturization
  - Demands for ultrahigh reliability
- **NASA's Assurance Research Process profoundly improves:**
  - Resources
  - Ability to rapidly and thoroughly assess new technologies

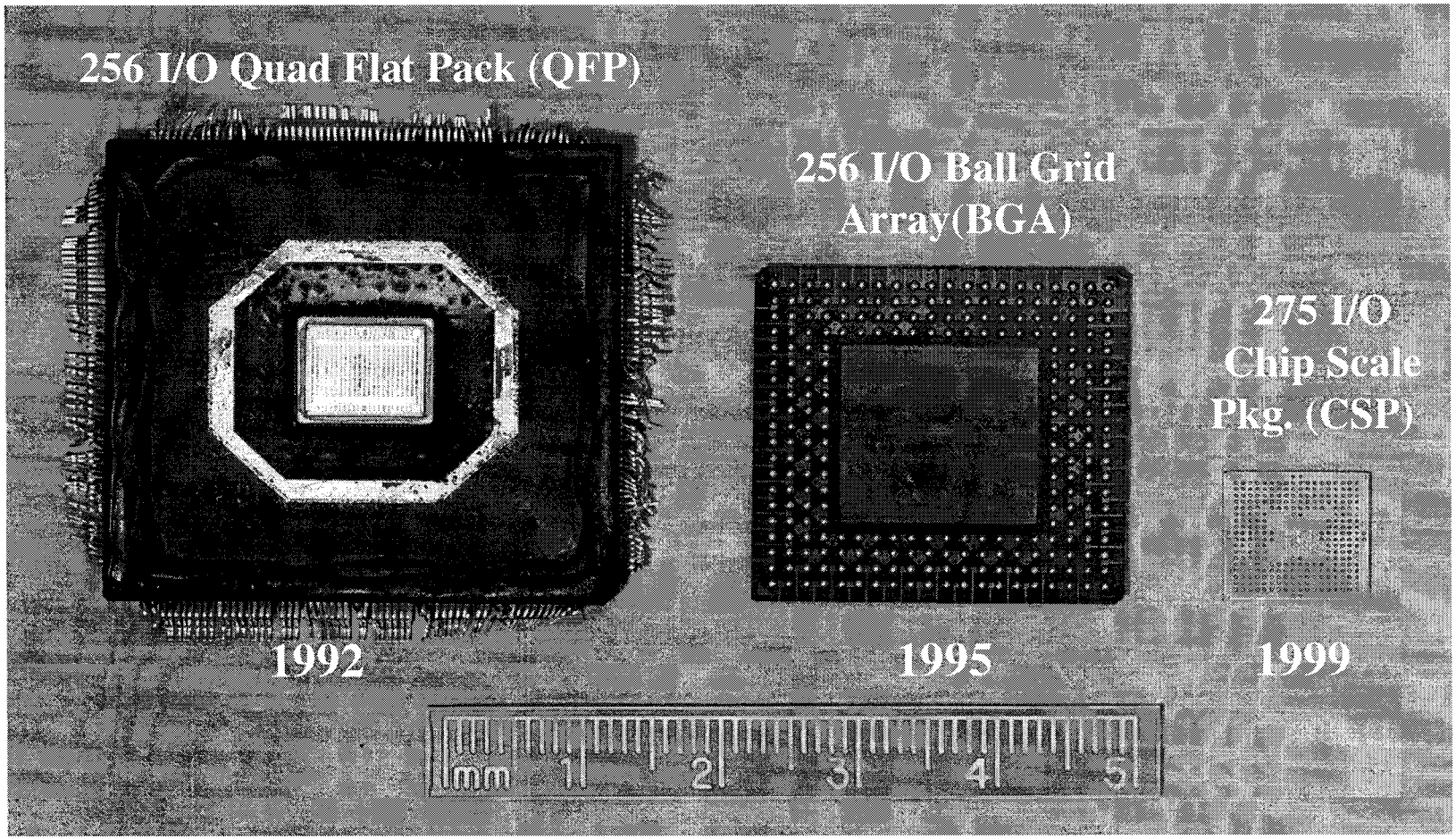
"Boeing Has Benefited Immensely"

Minas Tanielian
Manager
Sensor and Microsystem
Technology
Boeing Phantom Works

"Boeing has benefited immensely by the partnering with JPL and other industry representatives. As everyone realizes in these days of limited resources, no one company can afford to address issues regarding the introduction of new technology on their own. We are indebted to JPL, which took the incentive to organize the Consortium, coordinate its activities, and provide a forum for the exchange of ideas and information. This was a win-win activity which accelerated the insertion of new technology in various systems."

New Technologies = New Assessment Methods

- Today's technology mandates a proactive posture toward failure mode detection and prevention

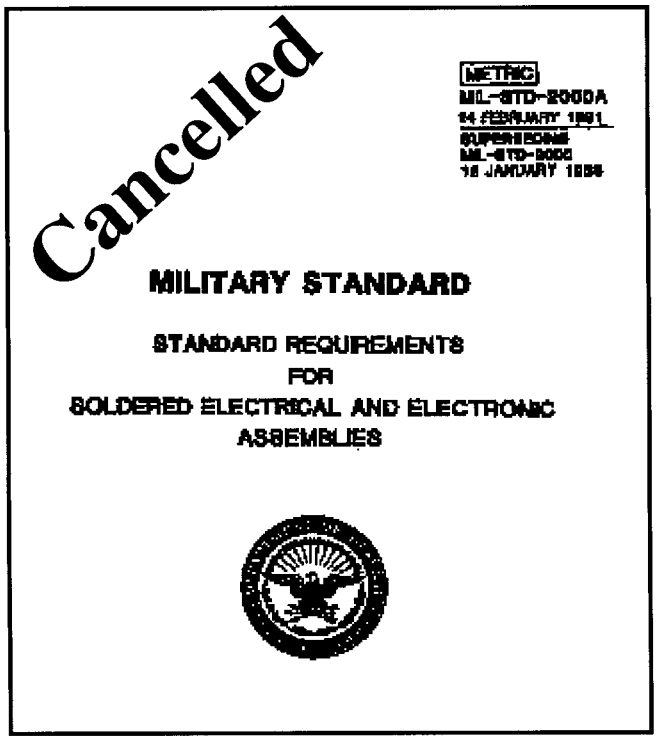


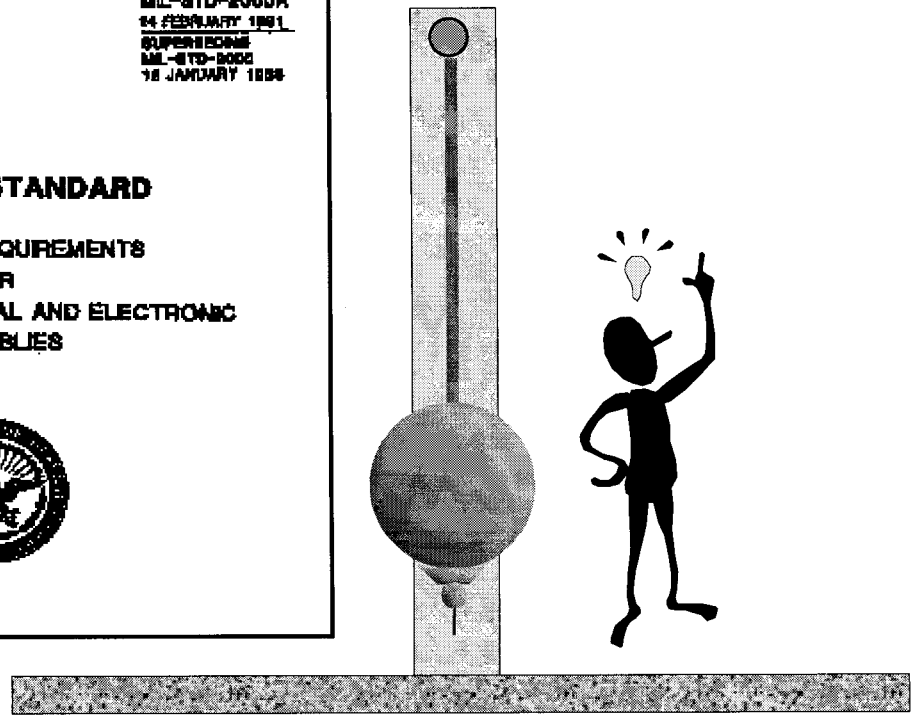
Keeping Pace Requires a Committed Set of Resources

The Pendulum Has Swung

RIGID REQUIREMENTS (HOW TO)

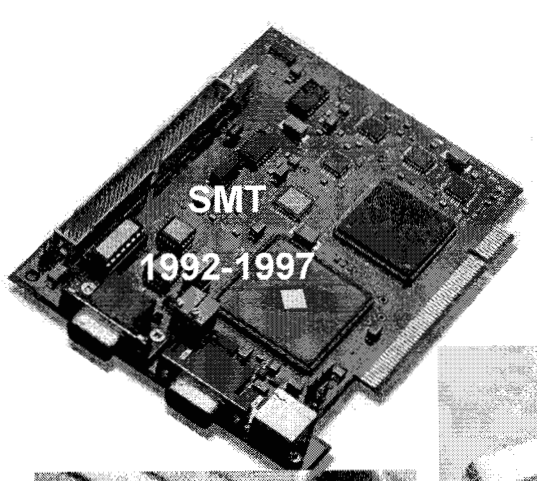
"DO THE RIGHT THING"

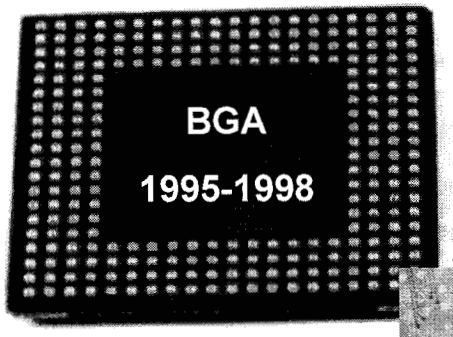


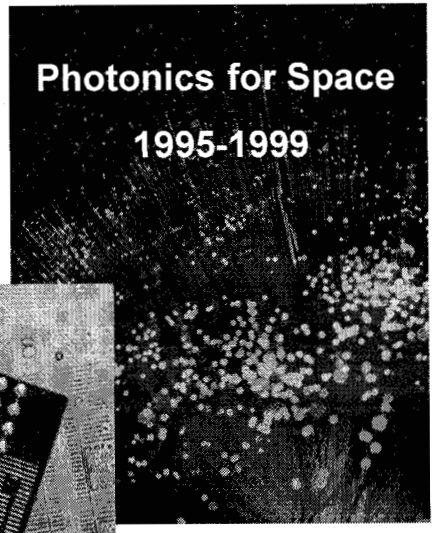


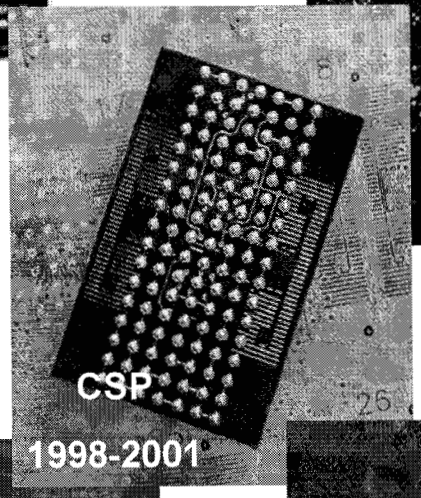
Accurate & Timely Guidance Is Required

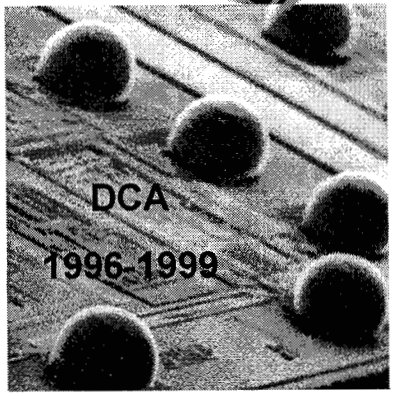
Strategic Alliances Focus on NASA/Industry Needs

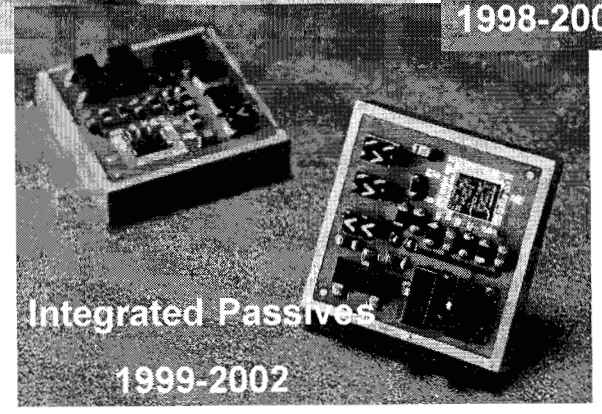


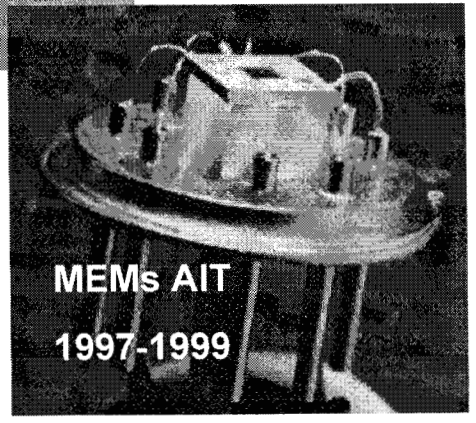






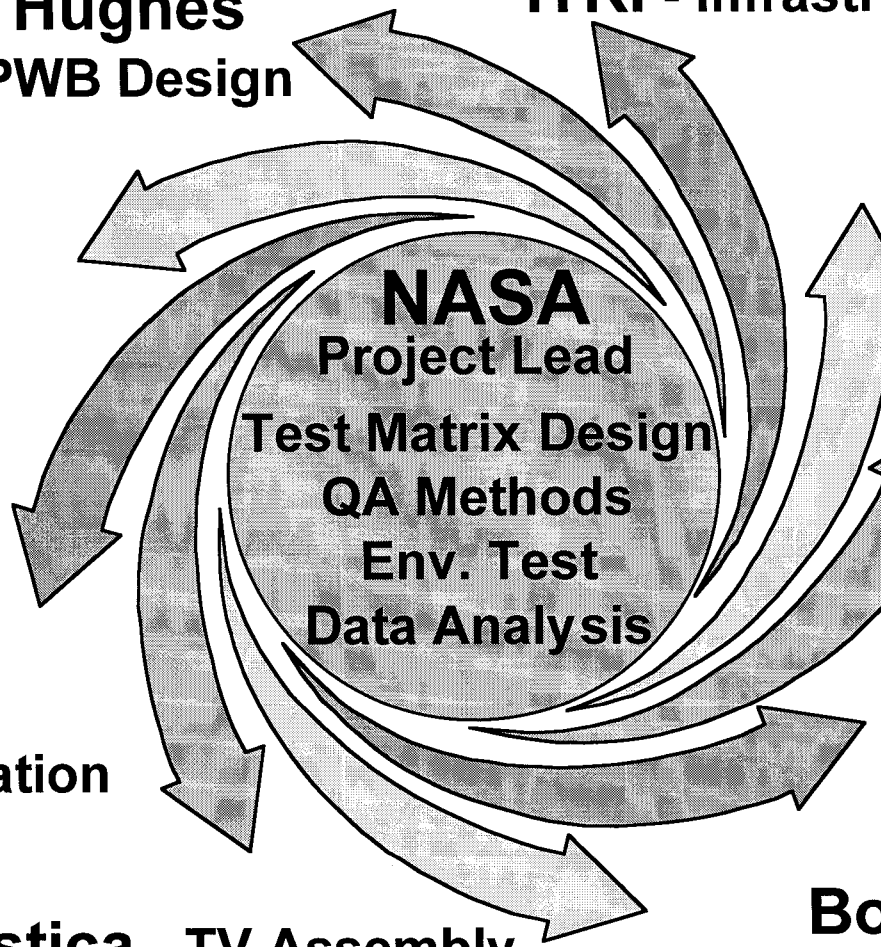






Teaming Launches NASA & Industry Into the Future

Leadership Is Essential to Success



Hughes
PWB Design

ITRI - Infrastructure

Amkor
Plastic Parts

IBM
Ceramic Parts

AMD
Resistive Die

Loral/Canada
Assembly/Test

GSFC - Modeling

Nicolet - X-ray

View Engineering
3-D laser

Altron
PWB Fabrication

EMPF
Environmental Test

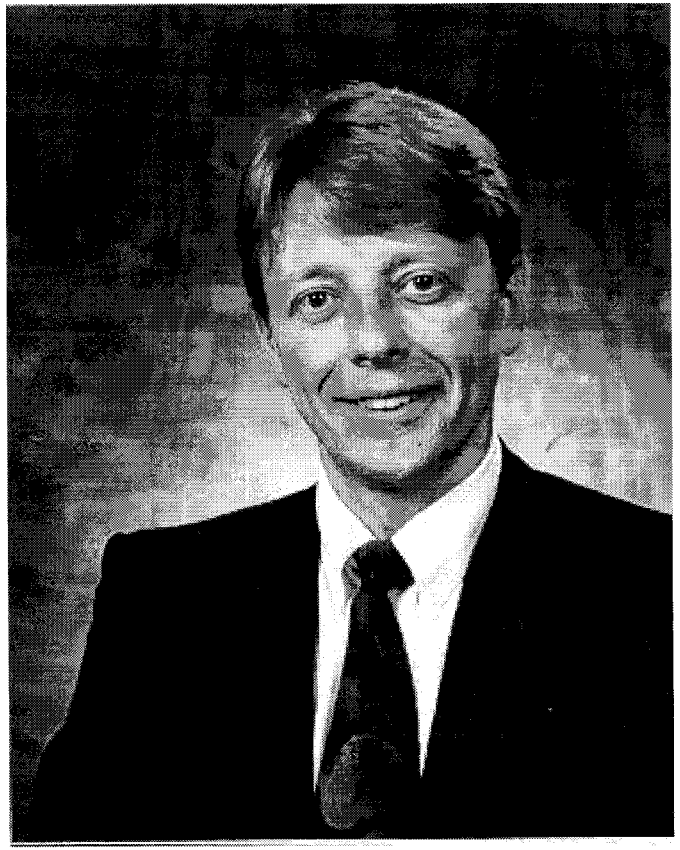
IBM/Celestica - TV Assembly

RIT University - TV Assembly

Boeing
Environmental Test
Failure Analysis

Interdependence

Celestica Gains Increased Credibility With Customers

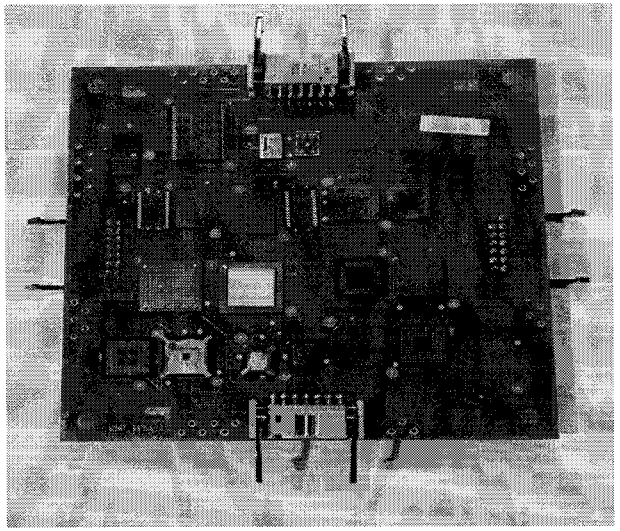


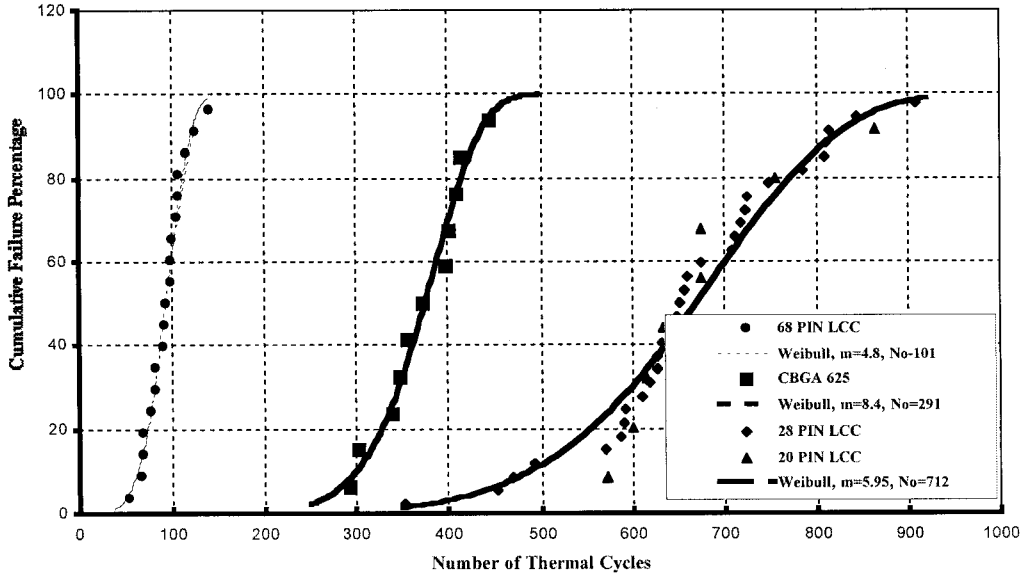
Dan Shea
Senior Vice-President
Chief Technology Officer
Celestica

"Celestica's involvement with JPL has been a great source of pride for our company. It was an honor to be selected to participate in the consortia activities. Over the past five years, Celestica has gained increased credibility with our customers and suppliers, process development leadership, and advanced research and development expertise from working with the JPL/NASA led consortium. It has been our pleasure to work with the JPL and our project partners, and especially to see the teams' achievements in action."

Products Enable NASA Missions

- Extensive testing to failure
- Extensive testing to failure
- Failure Modes ID
- Lifetime Prediction Models
- Parameter Dependency on Robustness
- Failure Avoidance Techniques
- Design Guidelines
- Testing Methods





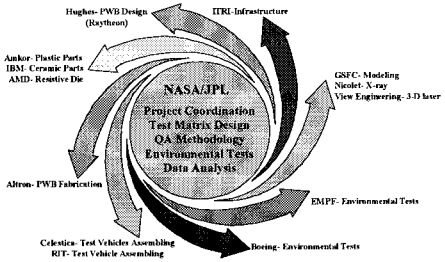
JPL

BALL GRID ARRAY PACKAGING GUIDELINES

By

Jet Propulsion Laboratory, California Institute of Technology

BGA CONSORTIUM TEAM



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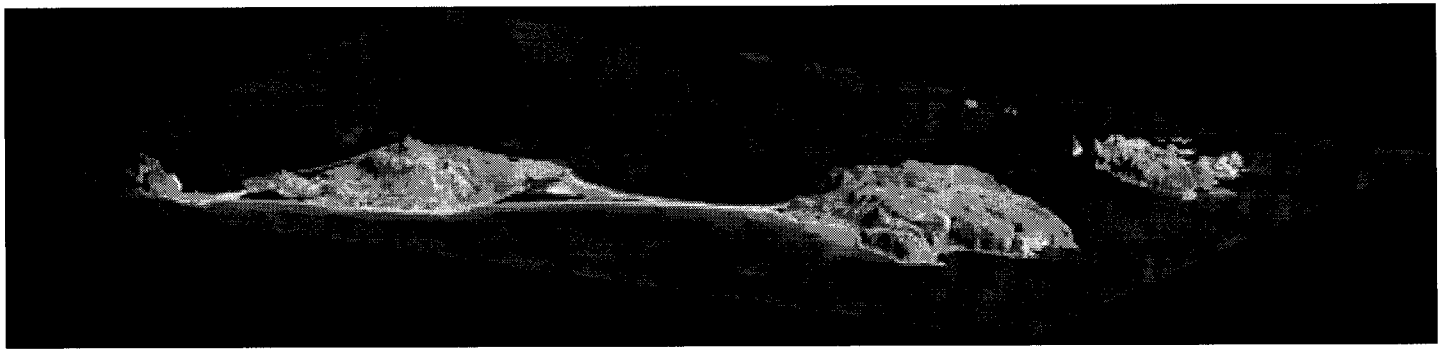
ITRI Interconnection Technology Research Institute

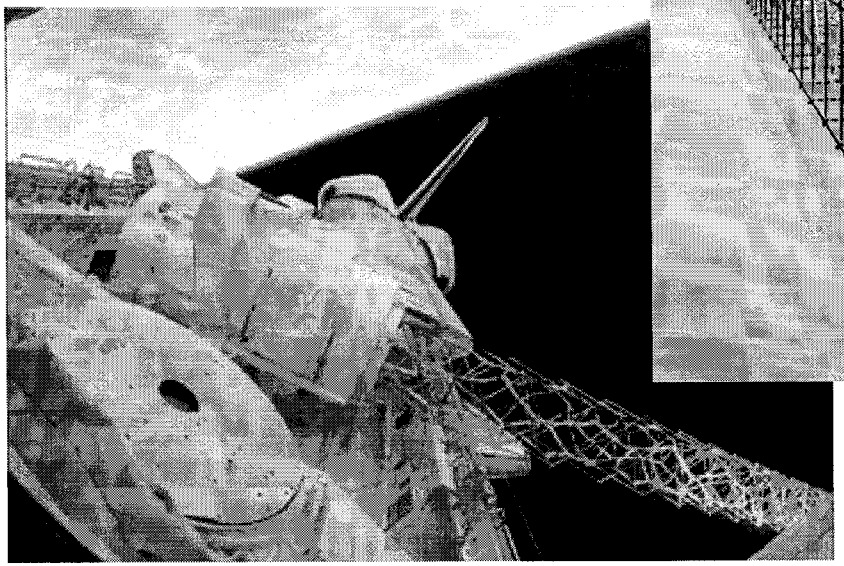
August 1998

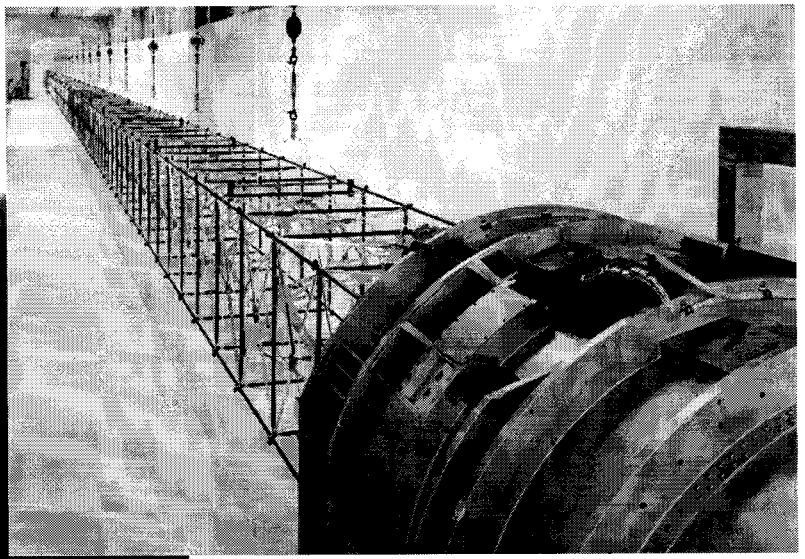
Strategic Alliances Provide Guidance to NASA Projects & Industry

Products Enable NASA Missions



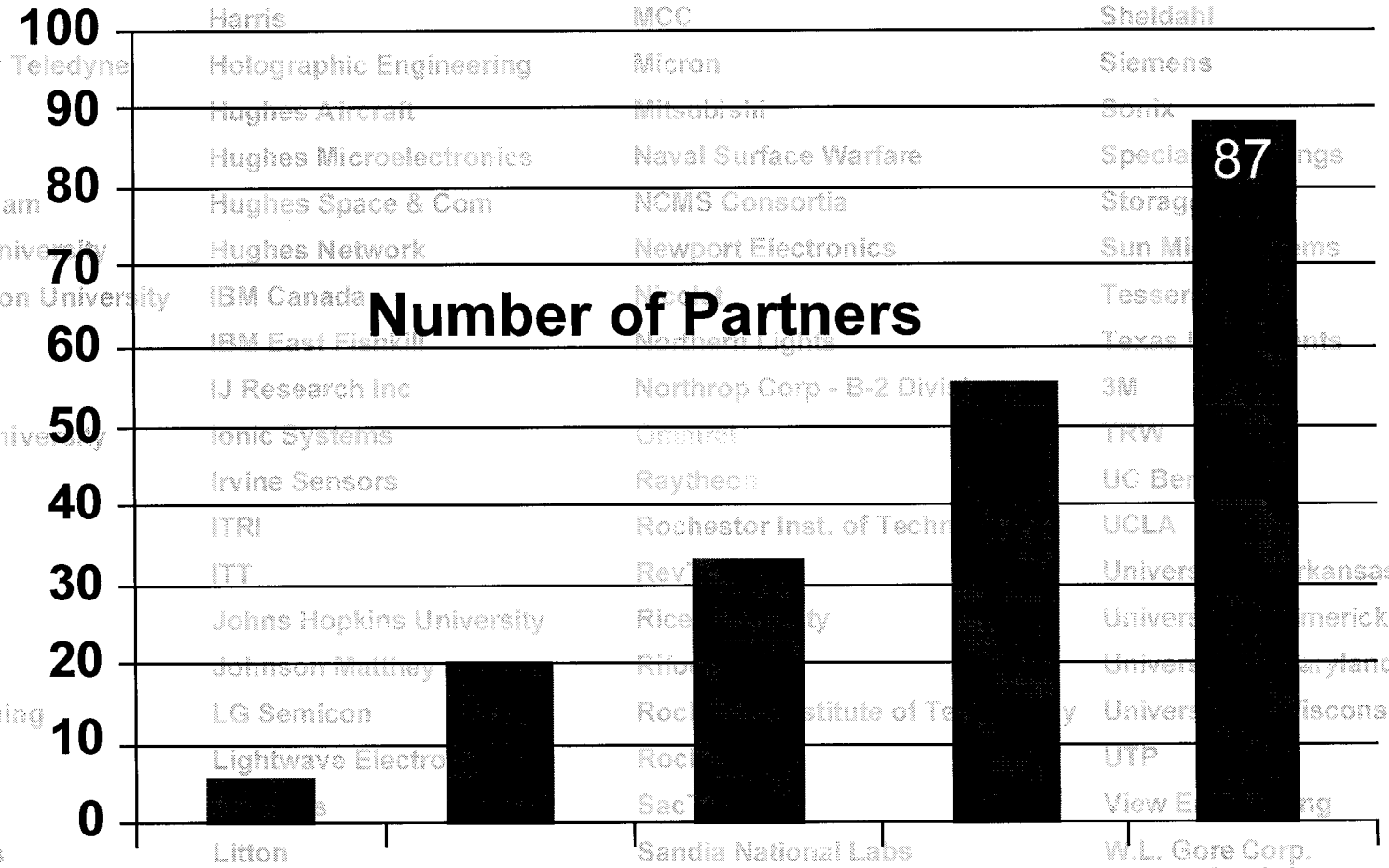
SRTM





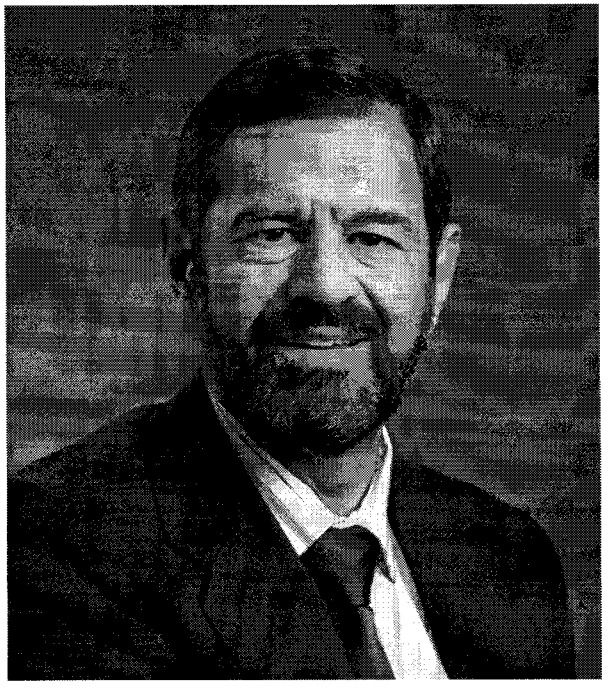
NASA Projects Enabled Through the Assurance Research Process

Capitalizing On Others' Strengths



Process Continues to Improve

Consortia is a Great Success Story



Paul Diamond

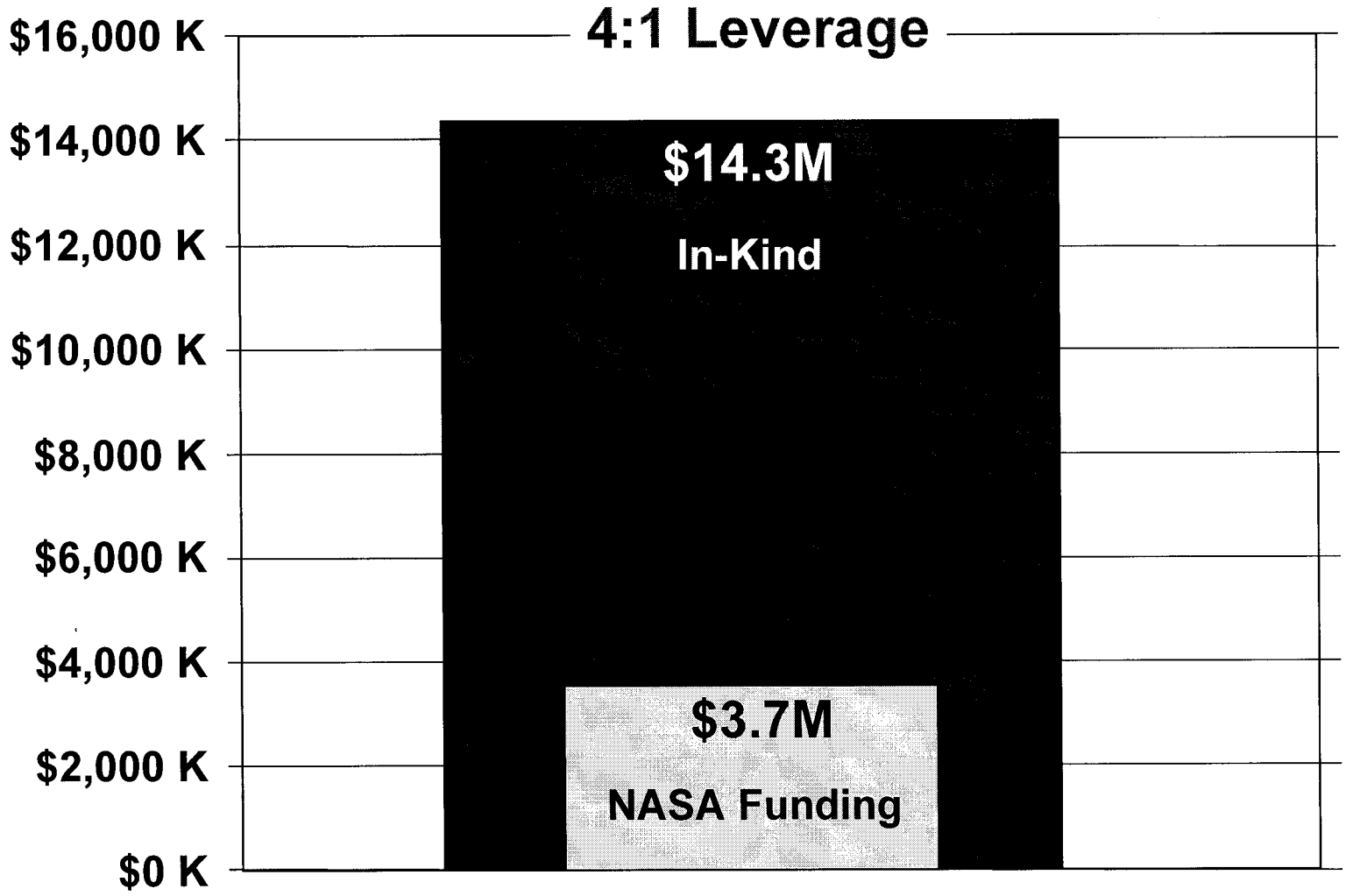
Director of Engineering

Raytheon

For Raytheon, our strategic alliance with JPL/NASA has been particularly beneficial. The consortia's "in-kind" contribution approach has afforded us the critical mass necessary to bring new packaging technologies into our missile and system design activities.

The high-density interconnect consortia has resulted in a great success story—one that constitutes a major accomplishment for all team members.

Leveraged Tasks Enable More Research



Strong Validation of NASA's Assurance Research Process

Conclusion & Recommendation

- **The NASA Assurance Research Process model:**
  - Enables more statistically significant research
  - Delivers results for NASA and Industry
  - Creates interdependence and synergy among the partners
  - Leverages resources
- **Future work should include expanding this process model beyond electronic packaging**